WFO-SOO Workshop at HRD, Miami, FL
May 12-13, 2005

1. Real-time Mesoscale Analysis (RTMA)

Problem: **How might we improve RTMAs in hurricanes?**

Issues:
- LAPS:
  - No GUI to let forecaster remove bad data, improve QC functionality
  - not flexible enough; only once every hour
  - not well documented
  - is a black box
- Mesoscale analysis:
  - proper influence radius?
  - numerous observations in one grid box?
  - Barnes/Cressman 1/R^2 or other?

- H*Wind not coming into WFO
- Need a standardized high-quality near shore mesoscale analysis and/or observations for approaching hurricanes
- Additional WFO computer resources for real-time mesoanalyses. Should they be run at every WFO or share resources among multiple offices?
- real-time access to Cuban radar
- QC of obs more important than ever!

Discussion:
- Why does WFO need to run LAPS? How does WFO document deficiency in order to raise issue at higher NOAA levels? (comparison between H*Wind and LAPS?)
- Need a robust standardized observation mesonetwork. Some standards exist but are not met.
- RTMA in hurricane situations, will it be representative? Run every hour or less.
- How would the forecaster use that information (RTMA)?
- LAPS is not limited, but unfriendly when customizing. Need to ingest aircraft observations. No QC interaction. FSL is not well funded to further develop LAPS.
- Near-shore mesonet analysis with the extensive observations HRD has available. Need wave/surge analysis.
- How do we get hurricane data sets into LAPS?
- What objective analysis parameters (spacing) do forecasters use in hurricane conditions?

Standards:
- bring hurricane data sets into AWIPS (NetCDF) (short-term)
- LAPS is the WFO standard tool for current RTMA. Ingest data sets into LAPS.
- H*Wind analysis gridded fields ingested into LAPS, in a fixed grid.
- ADAS, another tool
- meet certain computational capacity (CPU), time constraints (~ 5-10min)
- maximum of 5km resolution
- meet Internet security
- which QC tools needed?

Strategy:

- Access to 3-hourly H*Wind analyses in warning situations, performed in 24-hour mode.

- H*Wind grids formatted to display in AWIPS (Pablo Santos volunteers to help)
- Work with FSL LAPS group (John McGinley) to deal with hurricane-related issues (to get hurricane data sets into NetCDF->MADIS->LAPS)
- To help justify need: HRD to document examples of analyses (i.e. LAPS, etc.) and compare to H*Wind, RUC analysis, etc.
- Need to justify WFO need for RTMA in gridded form:
    forecast grids, short-term projection, persistence grids, forecast validation
- Wind contours with set probability of exceedance
- Provide infrastructure to run retrospective or real-time H*Wind analyses at WFOs (database access and password-protected web directories)
- Recorded visit view session for H*Wind training delivered to WFOs to consider both:
    1. WFO-run analyses for sub 1hr intervals
    2. NCEP-run analyses for hourly intervals (in the works)
- Any HRD surface wind staff will give talks at a WFO when traveling in the area
- Possible JHT connection

2. NDFD

Issues:
- Coordination inconsistencies
- Need real-time analysis grids
- Need high-resolution TPC grids
- Need best guess initial forecast from TPC/HRD with landfall wind decay
- Grids not accounting for varying terrain
- Grids should be probabilistic (how good is good?)
- How to transform from deterministic to probabilistic?
- Probability of event exceeding tropical storm or hurricane conditions
- Need "What if?" scenarios
- Ability to modify wind forecast if track deviates
- Express better forecast uncertainty for all customers (some are interested on worst-case, others on most-likely)
- Maximum wind possible grid based on error cone for EMs
- Go from probabilistic to text products
- Need best wind estimate
- Constrained velocity in extended periods

Discussion:
- Need probabilistic component to complement the deterministic grid, which currently is insufficient information to decision-makers. How do we bring probability to the current pure deterministic output?
- Need ability to do post-storm evaluation; currently only real-time information readily available. Useful to compare forecast versus to what actually happened.
- Inland decay needs to be more accurate
- Integrity of analyses of record, express confidence
- How to determine geographically-dependent errors?

Standards:
- all should use same tool, same guidance/official forecast, to maintain consistency

- provide wind-radii for forecast days 3-4-5
- meet TPC standards: 3-hour resolution, populated every 6 hours
- provide probability of exceedance in PFM, together with deterministic output
- make it meaningful to public
- probability should take terrain into account
- provide range of scenarios based on TPC error-cone, and their probabilities

Strategy:
- HRD can challenge the veracity of current tool (deemed good already) and provide improvements
- Friction tool in GFE gust tool
- Initial approach by WFO: develop proof of concept. (Maybe use DeMaria's product experimentally) Pablo Santos leads this idea.
- Ask WFO users on how to provide probability (text, graphical?)
- Gust factor research from CAT model algorithm G(t,z0)
- Refine decay related interpolation in gridded fields. Inland decay model
- Assistance on validating/evaluating probability grids that WFO experiments with
- Work with EMC about Analysis of Record (AoR)
- Geographic forecast error distribution
- Maintain dialog regularly

3. Experimental Research Products to WFO operations

Problem: **How to bring research experimental products into WFO?**

Issues:
- Need to create mechanism to deliver experimental products to WFO, could be for public or internal consumption only
- Multi-doppler capabilities for analysis (TDWR, Terminal Doppler Weather Radars)
- Short-term contribution to wind probability
- GBVTD (Ground-Based Velocity Track Display) single doppler
- List and decide which experimental wind products to transition to operations
- Existing, past and future JHT projects to WFOs
- Wave height calculation

Standards:
- a link to Pablo Santos' presentation

Strategy:
- Integrate radar data (TDWR, GBVTD) into H*Wind
- Identify top 2-3 issues for JHT, after going over previous JHT projects that might be useful to WFO
- Need a WFO representative in JHT Steering Committee

(Frank Marks will talk to Ward Seguin about getting WFO representation into JHT Steering Committee)

4. Mesonets and Portable Mesonets

Problem: **How might we share quality weather observations during hurricanes as a collaborative effort?**

Issues:
- Who pays and maintains mesonet station?
- Wind-related definitions speed, dir over time gust, peak sustained, ob, analysis, FCST
- SECORA, SECOOS (IOOS Integrated Ocean Observing Systems)
- Common server for portables, QC interface
- Replace Dry Tortugas CMAN
- Budget, budget, budget!
- Super obs, volume obs, virtual obs
- HF radars, CODAR, WERA
- Integrity classification mesonet data
- Lack of obs sites to provide backbone for mesonet
- Lack of marine data
- Burgeoning private sector surface obs
- PR Tsunami network (buoy)
- ASOS (sensitivity: not life saving decision related)
- ASOS failures, no reliable backup power
- Non-uniformity of observing equipment and siting
- Faster maintenance (CMAN left in disrepair too long)
- Standard 10m, time, high-quality
- Ground truth
- Harvest existing mesonets
- Mesonet clustered in population centers (inland areas suffer)
- Unavailability of FCMP obs

Standards:
- Exposure, height, time (ISO standard)
- Get data into centralized site (probably MADIS), available for all WFO.

MADIS staff is already aggressive on this.

Strategy:
- Get MADIS data in real-time; HRD is forbidden now because it is not part of WFO

(Nick Carrasco will continue to work on this, both short-term and long-term solution)
- Document all ASOS sites within 1 year (agreed on recent Mesonet conference)
- COOP program?
- Formulate a WFO statement of need for ASOS
- Possible contributions of HRD:
    - GPS sonde interpretation
    - real-time airborne doppler analysis
    - station exposure documentation
    - single doppler radar interpretation and applications
    - wind adjustment (height, exposure, avg. time)
    - SFMR interpretation and research
    - Aerosondes?

5. Uncertainty of Wind Estimates

Problem: **How might we express uncertainty or confidence of analyses?**
(specially for AoR)
Issues:
- NHC wind radii are not reduced to account for frictional effects
- Need more consistency among WFOs
- Many WFOs have only 1 observation site and no off-shore ground-truth
- Portable mesonets and fixed mesonet data untimely
- Post-storm wind estimates based on damage
- Uncertainty in aerial surveys due to building construction quality, soil, vegetation, etc.
- Uncertainty in ground surveys; same issues as aerial, plus problems of too little time, too much damage, etc.
- Wind gust extremes unaccounted for, but are responsible for much damage
- Can damage vs. gust variability be quantified?
- Greatest damage results from variability, rather than sustained wind
- Are uncertainties in estimates being properly conveyed to public and text products?
- Should greater emphasis be placed on gusts rather than sustained winds in warnings?
- More focus needed on inland decay
- Guidance needed on reduction factors (20% vs. ?)
- NHC gust factor (1.25) not well-correlated with obs gusts over land
- Actual gust factors range from 1.3 to 1.8
- Need for more wind estimates over marine/coastal areas
Standards:

Strategy:
- HRD could provide a better algorithm for wind gust factors over variability of wind speeds